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Performance of Yearling Steers Fed Beet Pulp or Chicory Pulp Rations

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Chicory pulp may lower feed intake but will produce comparable gains and efficiency to beet pulp.

Summary

Substitution of beet pulp or chicory pulp for corn silage was evaluated in a 64-day feeding trial using yearling steers. Rations contained 27.7 percent (DM) beet pulp or chicory pulp. Chicory pulp utilized in this trial is a suitable feed resource for beef cattle. Feed intake was significantly lower with chicory pulp addition. Palatability or very high water content of rations which reduced ration quality are potential reasons for decreased consumption of rations containing chicory pulp.

Introduction

Chicory is being investigated as a source of inulin at the University of Nebraska Panhandle Research and Extension Center at Scottsbluff, Nebraska. After inulin is extracted, the remaining chicory pulp is a possible feed resource for cattle. Previous research established root by-products such as beet pulp as excellent livestock feeds. The fiber in beet pulp is highly digestible and has relatively high net energy value. Chemical analysis indicates chicory is relatively high in highly digestible fiber. Palatability of chicory pulp is a concern, however, as it has a bitter taste. The objective of our trial was to compare the feeding value of chicory pulp with beet pulp and corn silage.

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Procedure

Ninety predominately Angus steers weighing an average of 951 pounds were randomly allotted to nine pens. Pens were randomly allotted to three different ration treatments. The control ration used to compare with the beet and chicory pulp containing rations (Table 1) consisted of corn silage, alfalfa hay, corn and a protein supplement containing Rumensin. Beet and chicory pulp comprised 27.7 percent of the ration dry matter which replaced corn silage in treatments 2 and 3. The rations were calculated to contain the same energy level (49 NEg, Mcal/cwt). Because assumed energy values of beet and chicory pulp were higher than corn silage, alfalfa hay was increased in rations 2 and 3 to offset the lower energy of corn silage. Protein content was made constant for all rations (13.5 percent) with three supplements containing different levels of protein and Rumensin.

The steers used in this trial were grazed the previous summer at the High Plains Ag Lab on primarily crested wheat grass pasture where they gained approximately 1.9 pounds daily for 114 days. They were then moved to the University of Nebraska Panhandle Research and Extension Center feedlot at Scottsbluff, Nebraska and fed a common backgrounding ration until the initiation of the trial on October 16, 1997. The steers were weighed on two consecutive days at the initiation of the trial in the early morning before feeding. They were poured for lice and grub control, vaccinated with modified live virus of BVD, IBR, PI_3 and BRSV, and implanted with Synovex-S at the initiation of the trial. At the end of the trial, in an effort to standardize gut fill, all steers were fed the control ration at approximately 90 percent of their past intake for five days and were again weighed on two consecutive days.

Analyses of the pulps fed are presented in Table 2. The pressed beet pulp was produced at the Western Sugar plant at Scottsbluff, Nebraska and is routinely fed to beef cattle in the region. The chicory pulp was produced by the pilot laboratory at the University of Nebraska Mitchell Laboratory by Cascadian Industries. The pulp was delivered to the feedlot in small, quantities and was usually stored for a short period (from zero to 14 days) and as a consequence did not undergo significant fermentation in storage. The delivered pulp was very high in water content (8.4-12.2 percent dry matter). The majority of the chicory pulp was not washed or dewatered and most likely contained some soluble carbohydrates that would provide energy in the pulp that would not be present if the solubles were extracted.

Results

Steer gain was highest for the corn silage ration ($P<0.1$). Chemical analysis of the corn silage, where energy values are estimated, averaged slightly higher (48.3 vs 47 NEg Mcal/cwt) than used in the ration calculations. The dry matter intake for the chicory pulp ration was considerably lower than the other two rations ($P<0.1$). This may have been due to the lower palatability of the chicory or perhaps the moisture content of the ration. Daily gains were not different for cattle fed beet or chicory pulp.

Cattle fed chicory rations consumed significantly less dry matter than those fed the other two rations. During the latter part of the feeding period, steers were consuming 55-58 pounds of chicory pulp and 75-80 pounds of total wet ration daily. Perhaps this level of total feed intake affected the total amount of DM they were able to consume. Initially the steers consumed the chicory ration at about the same level as the other two rations, however the dry matter intake was relatively low. The objective of the trial was to feed the rations ad libitum,

Table 1. Rations used in chicory trial.

	Percent dry matter		
	Control	Beet pulp	Chicory pulp
Corn silage	51.8	11.4	12.1
Beet pulp		27.7	
Chicory pulp			27.7
Corn	23.6	23.6	23.6
Alfalfa hay	18.9	33.1	30.7
Protein Supp - 58%[1]	5.7		
Protein Supp - 40%[2]			
Ionophore Supp[3]			
Calculated Ration Composition			
Dry matter, %	49.0	45.6	26.1
Crude protein, %	13.5	13.5	13.5
Net energy gain, Mcal/cwt	49	49	49
Calcium, %	1.0	1.0	1.1
Phosphorus, %	.29	.27	.27
Rumensin, g/t	26	26	26

[1]Protein supplement contained 58% crude protein with 38% from NPN - 420 g Rumensin/ton.
[2]Protein supplement contained 40% crude protein with 28% from NPN - 400 g Rumensin/ton.
[3]Ionophore supplement contained 8% crude protein and 1200 g Rumensin/ton.

Table 2. Analyses of beet and chicory pulp used in trial.

	Beet pulp	Chicory pulp
Dry matter, %	24.7	10.3
Crude protein, %	11.6	8.59
Acid Detergent Fiber, %	30.0	35.4
Ash, %	5.9	9.3
Estimated total digestible nutrients, %	73.4	69.3
Calcium, %	.73	.70
Phosphorus, %	.14	.24
Potassium, %	.52	1.43
Magnesium, %	.22	.15
Sodium, %	.16	.17
Iron, ppm	168	384
Manganese, ppm	47	28
Copper, ppm	7	10
Zinc, ppm	20	31

Table 3. Performance of yearling steers fed corn silage, beet pulp or chicory pulp rations (64 days).

	Control	Beet pulp	Chicory pulp
No. pens (replicates)	3	3	3
No. steers	30	30	30
Initial weight, lb	952	953	949
Final weight, lb	1177	1163	1158
ADG	3.52[a]	3.28[b]	3.27[b]
Feed intake (DM), lb	21.3[c]	21.8[c]	17.7[d]
Feed/gain[1]	6.06[e]	6.66[f]	5.43[g]

[1]Statistically analyzed as gain/feed.
[ab]Means with different superscripts are significantly different ($P<.1$).
[cd]Means with different superscripts are significantly different ($P<.01$).
[efg]Means with different superscripts are significantly different ($P<.05$).

however the daily intake data indicates the majority of feed changes were increases, questioning if maximum dry matter intake was achieved on some days of the feeding period. It was also noted the bunks were slick on numerous occasions. Because of overall high intake, all cattle gained at a higher level than would have been predicted.

Because of the significant reduction in feed intake the cattle consuming the chicory pulp were significantly ($P < .05$) more efficient than those fed the beet pulp ration. Part of the improvement in efficiency is due to the lower intake. When intake is limited an improvement in efficiency is often observed. The improvement of efficiency of the corn silage control diet over the beet pulp is due to the increase in gain over the beet pulp ration as the intake was essentially the same. In summary, chicory pulp can be utilized as a suitable cattle feed, however intake may be decreased and efficiency will be improved.

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